REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the pending application. The Office Action dated September 18, 2008 has been received and its contents carefully reviewed.

Claims 1, 7, 10-14, 16, 17-23, and 28 are hereby amended. Claims 4 and 9 are canceled without prejudice or disclaimer. Claims 29-31 are newly added. Accordingly, claims 1-3, 5-8, and 10-31 are currently pending. Reexamination and reconsideration of the pending claims are respectfully requested.

The Office Action objects to claim 12 under 37 C.F.R. §1.75(c) as being of improper dependent form for failing to further limit the subject mater of a previous claim. Applicant has amended claim 12 to more clearly define claimed subject matter. Applicant respectfully requests withdrawal of the objection.

The Office Action rejects claims 7, 11-17, 21-23, and 28 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Office Action states term "strong" renders the claim 17 indefinite. Applicant respectfully submits that "strong base" is a term widely used in the art and one of ordinary skill in the art would understand the meaning of "strong base." For example, Organic Chemistry (8th Edition, Solomons & Fryhle), Section 3.5C (attached) discusses the strength of bases, and provides examples of strong bases. Further, Applicant has amended claims 7, 11-14, 16, 17, 21, 22, and 28 to more clearly define claimed subject matter. Applicant respectfully requests withdrawal of the rejection.

The Office Action rejects claims 1 and 2 under 35 U.S.C. §102(b) as being anticipated by PCT Application Publication No. WO 99/61911 to Murray et al. (*Murray*). Applicant respectfully traverses the rejection.

As required in M.P.E.P. §2131, in order to anticipate a claim under 35 U.S.C. §102, "the reference must teach every element of the claim." *Murray* does not teach every element of claims 1-2, and thus cannot anticipate these claims.

Amended claim 1 recites, "the molecules of the second organic coating are residues of a compound chosen from monocyclic and polycyclic anhydride." *Murray* fails to teach at least this element of claim 1. In fact, *Murray* is completely silent with respect to the above-recited element of claim 1. Accordingly, claim 1 is patentable over *Murray*. Claim 2 depends from claim 1, and thus is also patentable over *Murray* for at least the same reasons as claim 1. Applicant, therefore, respectfully requests withdrawal of the 35 U.S.C. §102 rejection of claims 1 and 2.

The Office Action rejects claims 1-23 under 35 U.S.C. §103(a) as being obvious over Murray in view of French Patent No. FR-2783051 to Perez et al. (*Perez*). Claims 4 and 9 are canceled, so the rejection of these claims is moot. Applicant respectfully traverses the rejection of claims 1-3, 5-8, and 10-23.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. The combined teaching of *Murray* and *Perez* fails to teach or suggest every element of claims 1-3, 5-8, and 10-23, and thus cannot render these claims obvious.

As discussed, *Murray* fails to teach or suggest at least the above-recited element of claim 1, namely, "the molecules of the second organic coating are residues of a compound chosen from monocyclic and polycyclic anhydride." *Perez* does not cure the deficiency of *Murray* with respect to claim 1. *Perez* is also completely silent with respect to the above-recited element of claim 1. Accordingly, claim 1 is patentable over the combined teaching of *Murray* and *Perez*. Claims 2, 3, 5-8, and 10-23 variously depend from claim 1, and thus, are also patentable over the combined teaching of *Murray* and *Perez* for at least the same reasons as claim 1. Applicant, therefore, respectfully requests withdrawal of the 35 U.S.C. §103 rejection of claims 1-23.

Newly added claims 29-31 variously depend from claim 1, and thus are also patentable for at least the same reasons as claim 1.

The application is in condition for allowance. Early and favorable action is respectfully solicited. If for any reason the Examiner finds the application other than in
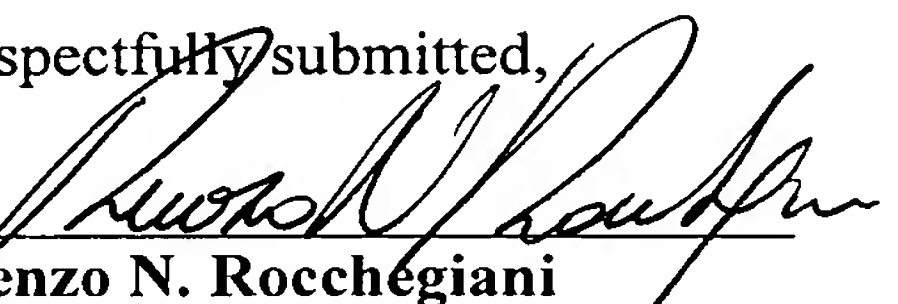
condition for allowance, the Examiner is requested to call the undersigned attorney at (202) 496-7500 to discuss the steps necessary for placing the application in condition for allowance. All correspondence should continue to be sent to the below-listed address.

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911.

Dated: February 18, 2009

Respectfully submitted,

By

Kenzo N. Rocchégiani
   Registration No.: 54,824
McKENNA LONG & ALDRIDGE LLP
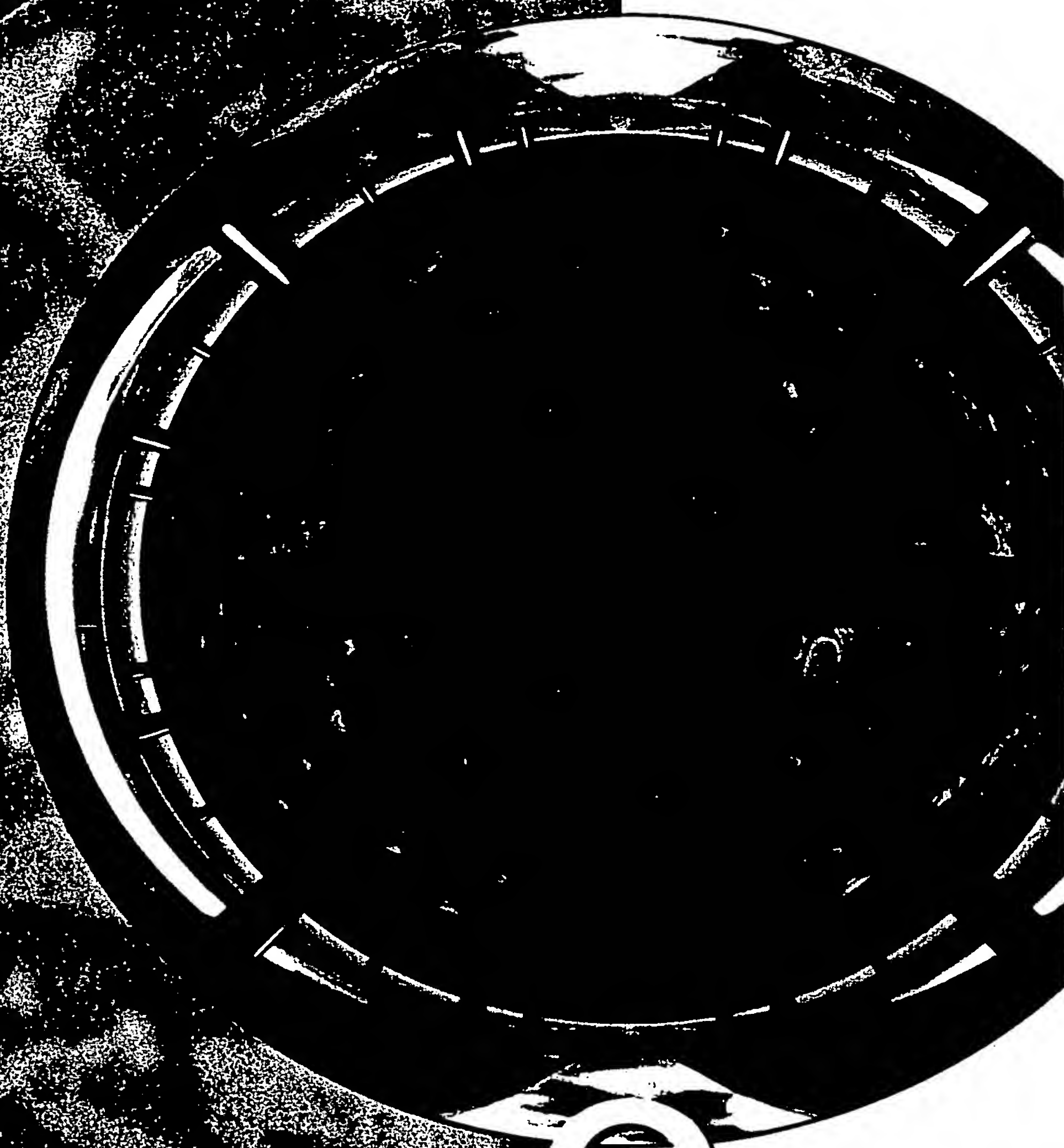1900 K Street, N.W.
Washington, DC 20006
(202) 496-7500
Attorneys for Applicant

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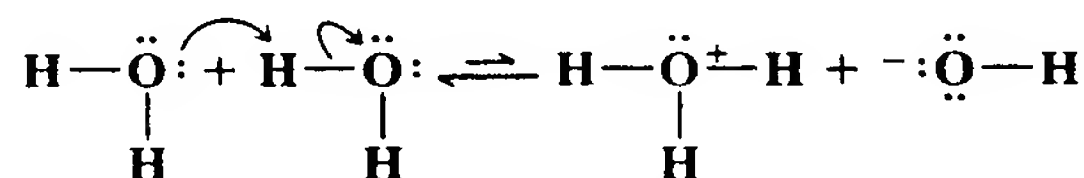
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ured in aqueous solution. Special methods must be used to estimate the pK_a values for th very strong acids at the top of the table and for the very weak acids at the bottom.* Th pK_a values for these very strong and weak acids are therefore approximate. All of th acids that we shall consider in this book will have strengths in between that of ethane (a extremely weak acid) and that of $HSbF_6$ (an acid that is so strong that it is called a "si peracid"). As you examine Table 3.1, take care not to lose sight of the vast range of acid ties that it represents (a factor of 10^{62}).

PROBLEM 3.5

(a) An acid (HA) has a $K_a = 10^{-7}$. What is its pK_a? (b) Another acid (HB) has a $K_a = 5$; what is its pK_a? (c) Which is the stronger acid?

Water, itself, is a very weak acid and undergoes self-ionization even in the absence acids and bases:

$$H-\overset{..}{\underset{H}{O}}: + H-\overset{..}{\underset{H}{O}}: \rightleftharpoons H-\overset{+}{\underset{H}{O}}-H + {}^-:\overset{..}{\underset{..}{O}}-H$$

In pure water at 25°C, the concentrations of hydronium and hydroxide ions are equal $10^{-7}M$. Since the concentration of water in pure water is $55.5M$, we can calculate the for water.

$$K_a = \frac{[H_3O^+][OH^-]}{[H_2O]} \qquad K_a = \frac{(10^{-7})(10^{-7})}{(55.5)} = 1.8 \times 10^{-16} \qquad pK_a = 15.7$$

PROBLEM 3.6

Show calculations proving that the pK_a of the hydronium ion (H_3O^+) is -1.74 as given in Table 3.1.

3.5C Predicting the Strength of Bases

In our discussion so far we have dealt only with the strengths of acids. Arising as a natur corollary to this is a principle that allows us to estimate the strengths of bases. Simp stated, the principle is this: **The stronger the acid, the weaker will be its conjugate bas**

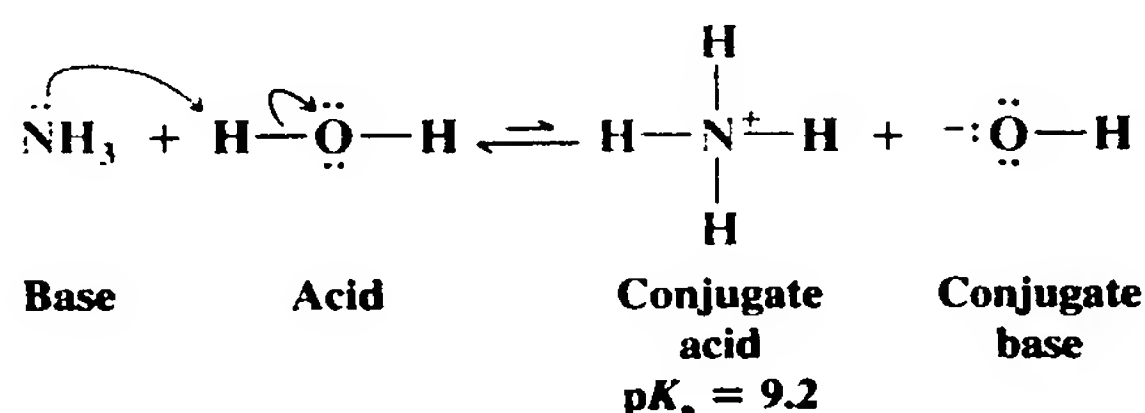We can, therefore, **relate the strength of a base to the pK_a of its conjugate acid. Th larger the pK_a of the conjugate acid, the stronger is the base.** Consider the followin as examples:

The relationship of acid–base conjugates is a very useful tool for predicting base strength.

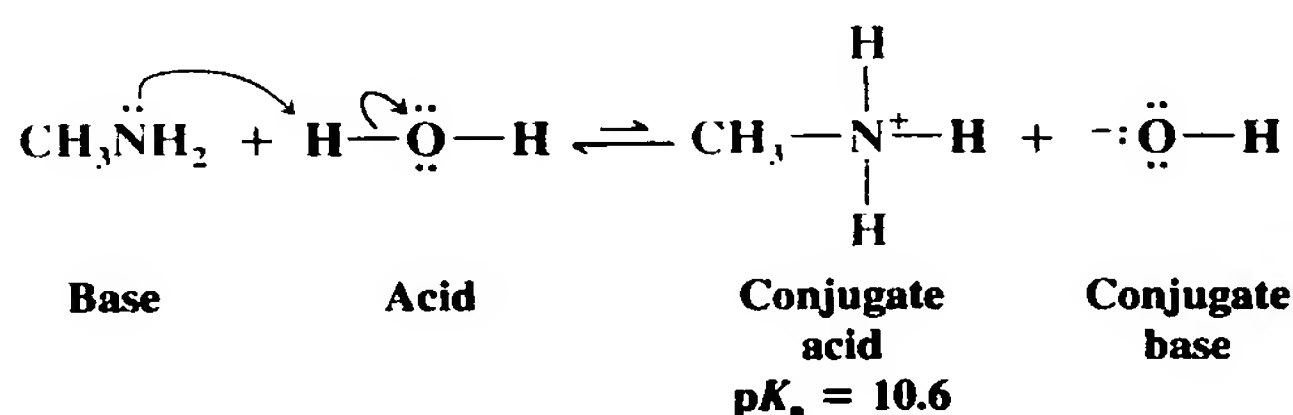| Cl⁻	CH₃CO₂⁻	OH⁻
Very weak base	**Weak base**	**Strong base**
pK_a of conjugate acid (HCl) = -7	pK_a of conjugate acid (CH_3CO_2H) = 4.75	pK_a of conjugate acid (H_2O) = 15.7

We see that the hydroxide ion is the strongest in this series of three bases because its co jugate acid, water, is the weakest acid. (We know that water is the weakest acid because has the largest pK_a.)

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*Acids that are stronger than a hydronium ion and bases that are stronger than a hydroxide ion react complete with water (a phenomenon called the leveling effect. see Sections 3.2A and 3.14). Therefore, it is not possible measure acidity constants for these acids in water. Other solvents and special techniques are used. but we do have the space to describe these methods here.

Amines are like ammonia in that they are weak bases. Dissolving ammonia in water brings about the following equilibrium:

$$NH_3 + H—O—H \rightleftharpoons H—\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{N^+}}—H + ^-:\ddot{O}—H$$

| Base | Acid | Conjugate acid | Conjugate base |

$$pK_a = 9.2$$

Dissolving methylamine in water causes the establishment of a similar equilibrium.

$$CH_3NH_2 + H—O—H \rightleftharpoons CH_3—\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{N^+}}—H + ^-:\ddot{O}—H$$

| Base | Acid | Conjugate acid | Conjugate base |

$$pK_a = 10.6$$

Again we can relate the basicity of these substances to the strength of their conjugate acids. The conjugate acid of ammonia is the ammonium ion, NH_4^+. The pK_a of the ammonium ion is 9.2. The conjugate acid of methylamine is the $CH_3NH_3^+$ ion. This ion, called the methylaminium ion, has a $pK_a = 10.6$. Since the conjugate acid of methylamine is a weaker acid than the conjugate acid of ammonia, we can conclude that methylamine is a stronger base than ammonia.

The pK_a of the anilinium ion ($C_6H_5\overset{+}{N}H_3$) is equal to 4.6. On the basis of this fact, decide whether aniline ($C_6H_5NH_2$) is a stronger or weaker base than methylamine.

PROBLEM 3.7

3.6 PREDICTING THE OUTCOME OF ACID – BASE REACTIONS

Table 3.1 gives the approximate pK_a values for a range of representative compounds. While you probably will not be expected to memorize all of the pK_a values in Table 3.1, it is a good idea to begin to learn the general order of acidity and basicity for some of the common acids and bases. The examples given in Table 3.1 are representative of their class or functional group. For example, acetic acid has a $pK_a = 4.75$, and carboxylic acids generally have pK_a values near this value (in the range $pK_a = 3-5$). Ethyl alcohol is given as an example of an alcohol, and alcohols generally have pK_a values near that of ethyl alcohol (in the pK_a range $15-18$), and so on. (There are exceptions, of course, and we shall learn what these exceptions are as we go on.)

By learning the relative scale of acidity of common acids now, you will be able to predict whether or not an acid–base reaction will occur as written. The general principle to apply is this: **Acid–base reactions always favor the formation of the weaker acid and the weaker base.** The reason for this is that the outcome of an acid–base reaction is determined by the position of an equilibrium. Acid–base reactions are said, therefore, to be **under equilibrium control,** and reactions under equilibrium control always favor the formation of the most stable (lowest potential energy) species. The weaker acid and weaker base are more stable (lower in potential energy) than the stronger acid and stronger base.

A general principle for predicting the outcome of acid–base reactions.